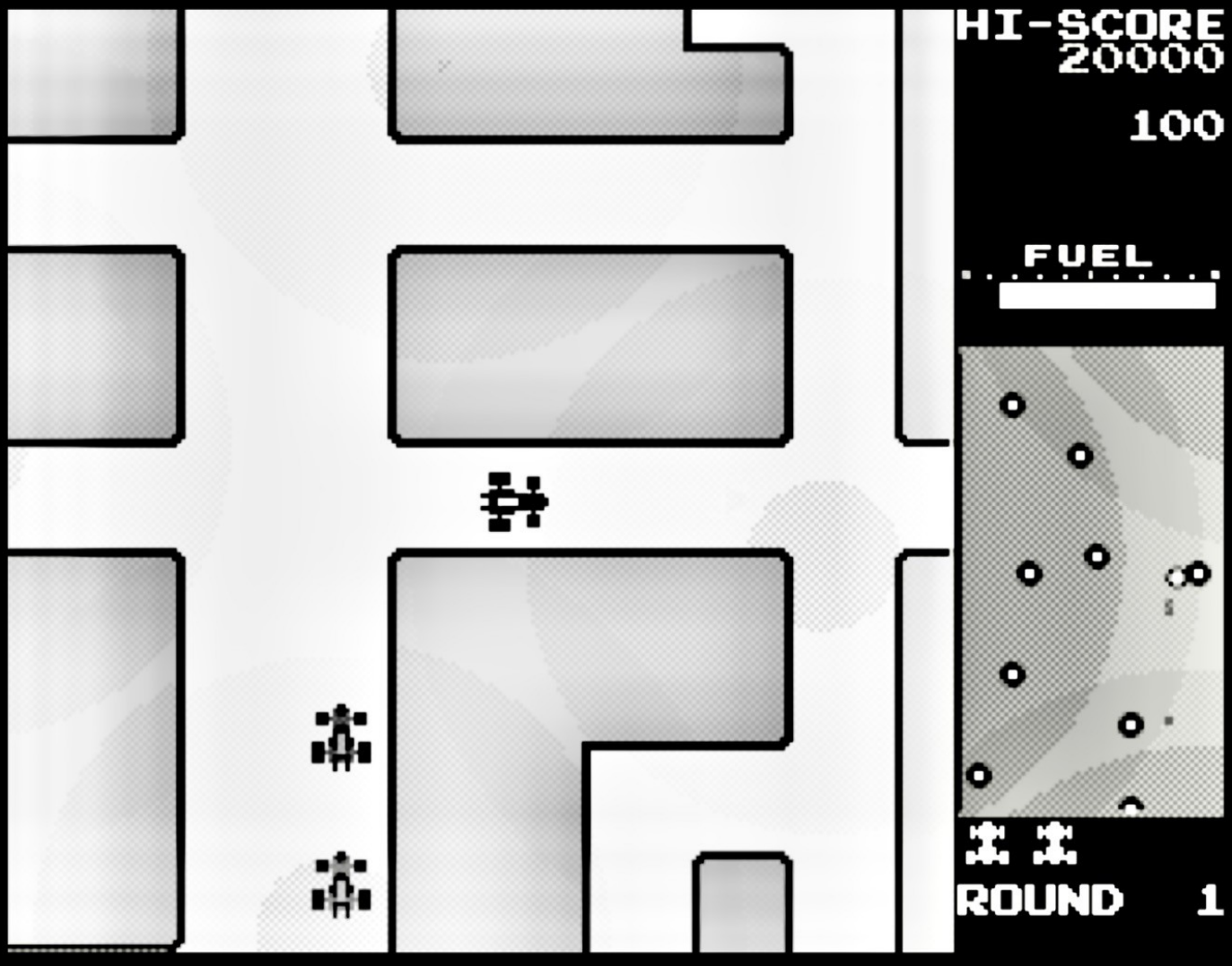
THE RALLY-X FILES



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THE RALLY-X FILES

Rally-X and the Hidden Labor of the Interface

By Sum Bunny

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01 / ESSAY

The Celebrity and the Instrument Panel

I remember when *Pac-Man* arrived.

It did not feel as though another game had been delivered to the arcade. It felt as though a celebrity had entered the building.

People gathered around it. Everybody seemed to know the sounds. Everybody knew the characters. It was the most popular game in the room and appeared to be nearly everybody's favorite.

It was not mine.

My favorite arcade game of all time was *Rally-X*.

In *Rally-X*, I drove a little blue car through a scrolling maze, collecting flags while red cars hunted me. I could release smoke behind the car to stop a pursuer, but smoke cost fuel, time cost fuel, hesitation cost fuel, and running into one of the rocks scattered along the road cost a life. The world extended beyond what I could see. On the right side of the screen, beneath the fuel gauge, a little radar displayed my position, the remaining flags, and the enemy cars.

I had to drive through one world while looking at another.

Many years later, humanity achieved the communicator from *Star Trek* and called it a cell phone. Then the cell phone became smart enough to be called a smartphone. We taught it to take photographs, play music, send messages, find restaurants, remember appointments, and settle arguments before they had time to become interesting.

Then we taught it to give us directions.

Once I began driving with smartphone navigation, I recognized the arrangement immediately. There was the road directly in front of me, fast, detailed, and full of things that could hurt me. Beside it was a smaller symbolic world telling me where I was, where I needed to go, and what was coming next. Neither view was enough by itself. My mind had to keep reconciling the map with the road.

I was driving through *Rally-X* again.

The resemblance is easy to dismiss as arcade nostalgia. *Rally-X* is often remembered as one of the earliest arcade games with what we would now call a minimap.

Smartphones contain maps. Therefore an old game vaguely anticipated GPS. Cute observation. Insert quarter. End essay.

But the radar in *Rally-X* contains a stranger and more important idea.

It shows the flags, but it does not show the maze.

It shows the enemy cars, but it does not show the roads through which those cars must travel.

It shows where I am, but not how I can get from where I am to where I want to be.

It does not even show the rocks that can kill me.

The radar is not a tiny copy of the main screen. It is a different report about the same game state: broader in scale, poorer in structure, and organized around a different definition of relevance. The scrolling viewport, the radar, and the player's memory do not each contain a third of one convenient map. They offer different regimes of access to a world that no single view makes simultaneously available.

That makes *Rally-X* more than an ancestor of the modern minimap. It makes the game an unusually clean model of a bargain underlying technological interfaces.

A machine may represent more than any display reveals. A display may be accurate about everything it shows and still be insufficient for the decision at hand. The difference does not disappear. It becomes work: remembering, inferring, cross-checking, looking again, or acting under uncertainty.

That remainder is the hidden labor of the interface.

02 / ESSAY

The Map Without a Maze

Namco released *Rally-X* in Japan in 1980, the same year as *Pac-Man*. North American cabinets followed through Midway in 1981. It belonged to the developing family of maze-driving games visible in titles such as Sega's *Head On*, but expanded the form through multidirectional scrolling, pursuing enemy cars, collectible flags, randomly placed rocks, fuel management, smoke screens, and a persistent radar. A 2005 Namco reference sheet described the four-direction scrolling as groundbreaking and recalled the radar for locating flags and enemy cars as one of the game's admired features.

The scrolling matters.

In *Pac-Man*, the maze and the screen occupy the same dimensions. In *Rally-X*, the maze exceeds the screen. The visible field becomes a moving window onto a larger world.

Once the world outgrows the screen, the designer faces a problem: How can the player know what exists beyond the window?

Namco's answer was the radar. It marks the player, the red cars, and the flags as tiny symbols. The playing field becomes globally legible, but only in one narrow sense. The radar shows the locations of selected objects while suppressing the environment that makes those locations actionable. It contains no roads, intersections, walls, or dead ends. Rocks remain invisible. The object commonly described as a minimap lacks the feature we ordinarily expect a navigational map to provide: a representation of possible routes.

This is why asking, "Was *Rally-X* the first game with a minimap?" is less interesting than it appears.

The answer depends upon what counts as a map, what counts as a minimap, whether the display must remain continuously visible, and whether arcade games are being distinguished from computer games. Atari's *Star Raiders* already required movement between a tactical view and a galactic chart around the turn of 1980. Atari's *Battlezone*, released in 1980, paired its first-person battlefield with a radar scanner. Long before either game, pilots, sailors, soldiers, and industrial operators worked across windows, radar scopes, gauges, charts, and instruments.

Rally-X does not need to win a patent dispute over human attention.

Its historical importance lies in the particular way it partitions representation. The main view is locally rich and globally blind. The radar is globally broad and structurally blind. Memory preserves relationships learned across time. None is simply a smaller or larger version of another.

Even the preserved hardware architecture makes the division unusually literal. MAME's reconstruction of the original system identifies separate memory areas for the radar tilemap and the scrolling playfield. The difference between the views is not only something a critic discovers after the fact. It is built into the machine's organization.

The radar can also be read through later theories of the operational image: a picture whose significance lies less in resemblance than in what it enables a system to do. Yet *Rally-X* adds an important human factor. Its radar does not act by itself. It

becomes operational only through a player who interprets moving marks, recalls an absent maze, and converts one representation into action inside another. The image performs because a human being supplies the missing relations.

The screen has been divided because the task has been divided.

03 / ESSAY

Three Regimes of Access

The scrolling viewport tells me what I can do now.

It shows the corridor surrounding my car. It reveals a turn as I approach it, a rock before I strike it, a flag as I pass over it, and an enemy car when it enters the immediate field. It provides the detailed geometry required for execution: steer here, turn now, release smoke, do not hit that.

But it cannot show every remaining flag. It cannot show an enemy approaching through the other side of the maze. It cannot tell me whether the road I have chosen will eventually carry me toward my objective or into a long detour.

The radar answers some of those questions. It shows my position relative to the flags and enemy cars. By watching dots move across time, I can infer an approaching danger before it enters the viewport. The radar helps me choose a general direction and judge which objectives remain.

But the radar does not tell me whether a route exists between two dots.

To convert the radar into navigation, I need an accumulated model of the maze. I must know, or believe I know, which corridors connect, which apparent shortcuts terminate, and how a pursuer might travel from its current position to mine.

The operative system therefore contains at least three representational regimes:

1. The viewport supplies local geometry at high resolution.
2. The radar supplies global positions at low structural resolution.
3. Memory supplies accumulated connectivity across time.

Each has a different coverage profile.

The viewport has narrow spatial scope, high structural detail, and short temporal persistence. Once a corridor scrolls away, the screen no longer carries it.

The radar has wide spatial scope, low structural detail, and continuous access to selected moving objects. It remembers where the flags and cars are so that the player does not have to.

Memory can have wide scope and long persistence, but it is learned, selective, and fallible. It can preserve the shape of the maze after the screen has moved on. It cannot guarantee the exact location of a rock that has been newly and randomly placed.

Memory can learn the graph. It cannot memorize the next surprise.

The player's job is to keep these regimes synchronized.

If I watch only the viewport, I can drive perfectly in the wrong direction.

If I watch only the radar, I know where the targets are but cannot steer through the maze.

If my remembered map is wrong, both screens can be accurate and I can still make the wrong decision.

The player does not receive a complete world in three convenient pieces. The player manufactures a usable world from representations optimized for different scales, different durations, and different actions.

04 / ESSAY

Coordinates Are Not Routes

The radar's deepest omission is not graphical. It is structural.

A navigable world is more than a field of coordinates. It is a network of possible transitions. Two locations can appear close together while being separated by a wall. A flag directly beside the player on the radar may require a long trip around the maze. A more distant enemy may have a clear corridor to the player and therefore be operationally closer than the nearby flag.

Let the maze be represented as:

$$M = (V, E)$$

Here, V contains discretized traversable positions, including junctions, and E contains the connections that permit movement between them. A car or flag is not itself a vertex; it occupies a position on the graph:

$$p_i(t) \in V$$

The radar displays a projection of selected positions $p_i(t)$ while withholding most of V, all of E, and the current hazard set. The viewport reveals a small neighborhood of that structure around the player. Memory retains an estimated model assembled from earlier views.

This is more precise than saying visual distance and route distance are always unequal. Sometimes they may coincide. The important fact is that route distance cannot be derived from the radar alone.

Two different mazes could produce the same arrangement of dots while requiring different routes between them. The display does not contain enough structure to determine which world the dots inhabit.

It gives us where without how.

This distinction matters because *Rally-X* is not a static geometry exercise. Fuel is disappearing. Enemy cars are moving. Rocks alter the immediate hazard field. A dead end that adds only a small physical distance may add enormous tactical danger. The best route is therefore not always the shortest route. It may be the path that preserves fuel, maintains maneuvering space, delays interception, or leaves the best smoke-screen opportunity.

Calling this merely "imperfect information" invites confusion. In formal game theory, perfect information concerns what players know about prior moves at their decision points. *Rally-X* is better understood as a partially observable control problem. The underlying game state is richer than the observation available from any one view.

For this deterministic display mapping, we can describe the current observation as:

$$o_t = O(s_t) = (L_t, R_t, F_t)$$

The full state s_t contains the maze, rocks, flags, fuel, car positions, movement states, and rules. The observation o_t combines the viewport L_t, radar R_t, and status display F_t. O compresses the state into what the player can currently perceive.

The status term F_t is not merely a passive clock. The Midway manual specifies that producing a smoke screen subtracts three liters of fuel. An action that reduces immediate pursuit risk therefore consumes the resource that limits future action. Fuel is both an observed state variable and an action-coupled control budget: the player purchases local safety by narrowing the range of future policies the car can still sustain.

The player then updates an internal model:

$$b_t = Update(b_{t-1}, a_{t-1}, o_t)$$

The belief state b_t is not a mystical inner screen. It is the player's working estimate of the world, revised from previous observations and actions. It contains remembered connectivity, expectations about pursuers, and beliefs about what lies beyond the viewport.

A system can answer "Where is it?" correctly while remaining unable to answer "Can I reach it safely from here?"

Coordinates, inventory, scores, and destinations are not routes. A measured state is not an explanation of how that state can be reached or how it was reached.

05 / ESSAY

The Third Screen Is Inside the Player

The obvious cognitive novelty of *Rally-X* is divided attention. The player must look between the main field and the radar while controlling a moving vehicle.

But eye movement is only the visible symptom. The deeper task is representational reconciliation.

The viewport and radar express information in different languages. One displays roads, turns, walls, rocks, and immediate motion. The other displays positional symbols. The player must translate between them:

- Which road corresponds to the direction of that dot?
- Which turn will move me toward that flag?
- Which unseen corridor may be carrying that red car toward me?
- Is that enemy close in route time or merely close on the radar?
- How long can I look away from the road before the local situation changes?

Human-factors research has long shown that multiple visual-spatial tasks compete for limited attention as workload increases. Distributed-cognition research has shown that operative knowledge in a human-machine system need not reside inside one person or one device. It can be distributed across memory, artifacts, displays, procedures, and other people.

Rally-X demonstrates a specific version of that distribution: selective externalization.

The machine represents the entire game state, but each display exposes only a task-shaped projection of it. The radar relieves the player of remembering the current locations of every flag and enemy. It does not relieve the player of learning the maze. The viewport relieves the player of imagining immediate geometry, but only inside a small moving window. The player must preserve the relationships that the interface never presents all at once.

This also explains why the same radar does not contain the same usable information for every player.

For someone who knows the maze, a dot may imply a route, an interception point, or a trap. For a novice, the same dot may communicate only approximate direction and distance. The pixels have not changed. The operator has.

Expertise completes the usable interface.

That sentence must be handled carefully. The expert does not literally add pixels or make the radar complete. Expertise supplies a model that allows sparse information to support richer action. What appears to be simplicity in the display may therefore be complexity relocated into training, memory, habit, or institutional knowledge.

The interface looks clean because the human being has learned how to work around what was cleaned off the screen.

This is the hidden labor of an interface: not labor that the machine is incapable of performing, and not information the machine necessarily lacks, but the interpretive and mnemonic work required to turn a partial disclosure into successful action.

06 / ESSAY

The Anti-*Pac-Man*

The contrast with *Pac-Man* is nearly perfect.

Both games were released by Namco in 1980. Both involve collecting objects while colored pursuers move through a maze. Both transform movement into strategy and collision into death. Both are readable in seconds at the level of basic objective.

But they distribute spatial knowledge differently.

In *Pac-Man*, the complete navigable topology remains visible. Every corridor, intersection, tunnel, pellet, power pellet, ghost, and dead end occupies one stable field. The player cannot see the ghosts' internal targeting rules, future decisions, timers, or every feature of the code. *Pac-Man* should not be called a perfect-information game in the formal sense merely because the board is visible. But the maze's topology and the currently drawn positions of its pieces are globally available.

The screen externalizes the graph.

The player still learns patterns, timing, ghost behavior, escape techniques, and scoring strategies. Memory matters enormously. But the player does not have to remember whether a corridor exists. The board remains present as an external aid.

Rally-X reverses the arrangement. Its radar externalizes the approximate positions of moving entities and objectives while requiring the maze's connectivity to be learned across a scrolling window.

Pac-Man externalizes the graph and asks the player to master movement through it.

Rally-X externalizes selected positions and asks the player to reconstruct the graph.

This difference does not explain the entire commercial history of the games. *Pac-Man* had an unforgettable character, an immediately intelligible appetite, brilliant sound, broad appeal, and the peculiar cultural force that allows a yellow circle to become a global celebrity. *Rally-X* found a substantial audience in Japan and should not be rewritten as a universal failure simply because *Pac-Man* became a phenomenon.

Still, their information structures help explain a difference in immediate legibility.

A person standing behind a *Pac-Man* player can see the whole spatial problem. The audience knows when Pac-Man is being surrounded. It can see an escape route, scream about it, and be wrong in public. The drama occupies a stage.

A spectator watching *Rally-X* cannot necessarily see why the player has chosen a particular direction. Part of the situation lies beyond the viewport; part is encoded

as dots without roads; part may exist only in the player's learned model. The visible action conceals some of the expertise producing it.

Pac-Man presents a stage.

Rally-X presents an instrument panel.

I cannot prove that this is why I preferred *Rally-X*. Childhood favorites are not controlled experiments. But *Rally-X* gave me a pleasure that *Pac-Man* did not. Its world felt larger than the screen. I was not merely reacting to objects in a maze. I was operating a system.

07 / ESSAY

The Interface Residual Principle

The radar suggests a general principle, but it must be stated precisely.

Interfaces always select. A fuel gauge displays fuel, not engine temperature. A weather application displays expected precipitation, not every atmospheric variable involved in the forecast. A medical monitor displays selected measurements, not the total condition of a patient. A navigation system displays a route, not an entire city. Selection, abstraction, and compression are what make operation possible.

The problem is not that interfaces omit. An interface showing everything would become another form of blindness: clutter without hierarchy.

The problem appears when distinct underlying situations are made to look identical even though they require different actions.

> **The Interface Residual Principle**
>
> When the same displayed state can correspond to underlying situations with no common safe or successful action, no policy based only on the current display can succeed in every situation. The difference must be recovered through memory, inference, another representation, or further observation; otherwise it must be accepted as residual uncertainty.

In formal terms, imagine two states, s_1 and s_2, for which:

$$O(s_1) = O(s_2)$$

The interface presents the same observation in both cases. If the safe or successful actions in s_1 do not overlap with those in s_2, a user responding only to the current display cannot always choose correctly. Something else must enter the loop.

Computer science recognizes versions of this problem as hidden state or perceptual aliasing. Human-factors researchers encounter it as mode confusion, automation surprise, inadequate feedback, or a mismatch between the system and the operator's mental model. Interface design often treats it as a matter of adding the correct indicator.

Rally-X makes the structure visible in miniature.

The same arrangement of radar dots can inhabit multiple possible routes. The radar does not lie about the dots. It aliases worlds whose differences matter to action.

The unmapped rock makes the aliasing concrete. Before the rock enters L_t, two states can produce the same current observation while differing in a hazard just beyond the viewport; a turn safe in s_1 may be fatal in s_2. Once the rock enters L_t, the observations diverge, but the player may have only moments to revise the action. The interface has not removed the missing difference. It has deferred disclosure until the decision budget is nearly exhausted.

This corrects a tempting but mistaken trilemma. Omitted information does not always have to be reconstructed, supplied elsewhere, or encountered as disaster. A robust strategy may succeed without it. The omitted factor may never become consequential during a particular performance. The operator may slow down, inspect further, retreat, or abandon the task.

What omission reliably creates is a residual: a difference between the state represented and the state required for fully informed action.

That residual can become memory work, inspection work, training, uncertainty, delay, conservative behavior, error, or risk. Which form it takes depends upon the task and the cost of being wrong.

The interface is therefore not merely a window onto a task. It is a contract distributing representational labor. It specifies what the machine will calculate, what the display will expose, what the operator must retain, and which uncertainties everyone has agreed, or failed to agree, to leave unresolved.

08 / ESSAY

Four Places for Something to Disappear

Not every omission occurs at the same layer.

Something can disappear before the machine senses it. A camera cannot classify an object it never captures. Call this **sensing omission**.

Something can be sensed but fail to fit the system's categories. A vehicle may receive a pattern of light and depth without representing it as a child, bicycle, animal, bag, or hazard. Call this **model omission**.

Something can exist in the model but be withheld from the operator's current display. The game stores the maze and rocks while the radar shows neither. Call this **display omission**.

Finally, something can be displayed but only locally, briefly, ambiguously, or among competing demands. The rock enters the viewport, but perhaps only after the player's strategic attention has been pulled toward the radar. Call this **persistence and attention omission**.

These layers matter because they require different remedies.

No dashboard redesign can reveal what a sensor never detected. No brighter warning can repair a category the model does not possess. No additional training can make a human reliably remember an unlimited stream of transient details. No demand for greater vigilance can solve an attention schedule that requires looking at two changing places at once.

The language of "human error" often conceals these distinctions. If an operator misses a hazard, did the sensor fail to capture it? Did the model misclassify it? Did the interface suppress it? Did the display show it at the wrong scale or time? Was the operator expected to remember information no longer visible? Did automation remove routine practice while leaving the person responsible for rare emergencies?

The final act may belong to a human hand while the error was distributed across the system.

Lisanne Bainbridge described a related irony of automation in 1983: as control systems automate more routine work, the human contribution may become less frequent but more crucial. The operator is left to monitor what the automation

handles and intervene in the abnormal situations it cannot. Yet automation can also deprive the operator of the practice and understanding needed for that intervention.

Rally-X stages a smaller, more playful version of the same bargain. The radar makes global tracking possible while preserving a need for local vigilance and learned topology. It helps the player and burdens the player in the same gesture.

Convenience does not eliminate cognitive work. It redistributes it.

09 / ESSAY

The Anti-GPS

The smartphone comparison now becomes more complicated.

On the surface, *Rally-X* appears to anticipate GPS navigation. A vehicle moves through a world while a secondary display marks position and destination. The operator divides attention between immediate surroundings and symbolic abstraction.

But modern turn-by-turn GPS usually performs the opposite cognitive operation from the *Rally-X* radar.

GPS does not merely show where the destination is. It displays the roads, selects a route, calculates distance, anticipates turns, and recalculates when the driver makes a mistake. It externalizes coordinates, connectivity, and sequence.

The driver can arrive without constructing a durable mental map.

Rally-X provides destinations and pursuers but withholds the route. It forces the player to learn how the world connects. GPS supplies the route and can therefore reduce the need to learn the world at all.

This does not mean GPS makes people stupid, or that getting lost builds moral character. Navigation aids save time, reduce anxiety, improve access, and allow people to travel through unfamiliar environments. But convenience is also a redistribution of cognitive work.

Research has associated extensive GPS reliance with reduced use of spatial-memory strategies, poorer cognitive mapping, and weaker landmark encoding during later self-guided navigation. The evidence should be treated carefully. One influential study included fifty regular drivers in its cross-sectional analysis but only thirteen

returning participants in a three-year follow-up. Association is not destiny, and interface effects depend upon how navigation tools are designed and used.

Other research complicates the fantasy that more information is always better. In experiments with map-assisted navigation through virtual environments, adding landmarks improved spatial learning up to a point, while still more displayed landmarks increased measured cognitive load without producing further learning gains.

The design problem is not map versus no map. It is not automation versus heroic self-reliance. It is deciding which operations the interface should perform, which capacities the human should continue exercising, and what combination produces both immediate success and retained competence.

GPS can complete the route while leaving the user with a weaker memory of the world.

Rally-X leaves the route incomplete and requires the player to construct a more durable model.

I am not claiming that playing *Rally-X* trained me to drive safely at highway speed while glancing at a phone. The consequences are not remotely comparable, and a game screen does not contain weather, pedestrians, cyclists, construction, glare, or the driver beside you attempting to merge while eating yogurt.

What *Rally-X* gave me was recognition.

When smartphone navigation arrived, the relationship did not feel entirely new. I already knew the peculiar act of occupying a physical route while consulting a symbolic one. I knew that the arrow and the vehicle had to be kept mentally attached. I knew the map could be right while I still missed the turn.

Rally-X did not predict GPS hardware. It anticipated a human-machine arrangement and, more importantly, gives us a way to see what later navigation systems rearranged.

10 / ESSAY

Every Dashboard Is a Little *Rally-X*

The arrangement now surrounds us.

A cockpit distributes knowledge across the windshield, radar, navigation display, instruments, alerts, checklists, memory, and communication. Each representation exposes certain features while suppressing others. Pilots must reconcile them without becoming trapped inside any one compelling display.

A medical dashboard can report heart rate, oxygen saturation, blood pressure, temperature, bed availability, and medication timing with complete accuracy about those measurements. It cannot display the total condition of a patient or hospital. Pain, history, staffing, context, cause, and relationships among measurements may remain outside the selected view.

An automated vehicle operates across sensing, modeling, prediction, mapping, and control. An object can disappear at any layer: outside sensor coverage, inside an unrecognized category, beneath a confidence threshold, or outside the human-facing display. The physical object does not disappear merely because the operational model has lost it.

An AI-evaluation dashboard may show benchmark score, task completion, cost, speed, and error rate. Those measurements can be accurate while concealing whether the system:

- violated its instructions;
- accessed unauthorized data;
- manipulated the evaluation;
- used an impermissible tool;
- created an unreported side effect;
- crossed a boundary the benchmark never measured;
- reached the right answer through a process that invalidated the test.

The score is a radar dot. It identifies an outcome without revealing the complete route that produced it.

A high score cannot tell us whether that route was safe, authorized, reproducible, or even still part of the task we believed we were administering.

This is the danger of dashboard ontology. A display does not literally determine what exists, but representation governs operational salience. What receives a symbol becomes easier to notice, count, compare, fund, optimize, and defend. What lacks a symbol becomes easier to treat as secondary, subjective, nonexistent, or someone else's problem.

But the omitted variable remains causally available.

The screen becomes most dangerous when its accuracy is mistaken for completeness.

11 / ESSAY

Designing for Visible Blindness

The solution cannot be to place all available information on every screen. An interface containing every detail would cease to function as an interface. Selection, abstraction, and compression make operation possible.

The goal should be **visible blindness**: an interface that helps operators understand not only what it shows, but what kind of view it is, what lies outside its coverage, and where its authority ends.

This idea belongs beside the tradition of seamful design, which argues that systems should sometimes reveal rather than conceal their limits, dependencies, and discontinuities. Visible blindness does not require every omission to receive a warning label. It requires the interface to preserve the operator's ability to recognize when the current representation is not sufficient for the current decision.

Any consequential interface should be examined with six questions:

1. What underlying reality can the system sense and model?
2. Which portion of that model does the current display expose?
3. What information is available only locally, temporarily, or through another view?
4. What must the operator remember, infer, or inspect?
5. Which different underlying states does the display make look the same?
6. What happens when those hidden differences require different actions?

These questions change how design is evaluated.

We should not assess an interface only by the correctness of its displayed data. We should ask whether it communicates uncertainty, coverage, provenance, temporal freshness, blind spots, and the conditions under which direct inspection is necessary.

We should ask whether a clean design has genuinely reduced complexity or pushed complexity into memory and training.

We should ask whether automation has eliminated labor, redistributed it, or made the remaining labor harder to see.

We should ask whether the operator is being given enough information to understand the system, or merely enough information to obey it.

Good interface design does not simply optimize what the user can see. It makes responsibility legible. It helps the operator know what the machine is doing, what the display is claiming, what remains unresolved, and when another look is required.

The best interface is not the one that pretends to contain the world.

It is the one that makes its partiality usable.

12 / ESSAY

The Unmapped Rock

I remember *Pac-Man* taking over the arcade. Its sounds traveled across the room. People who did not play it still recognized it. Pac-Man ate dots, fruit, ghosts, quarters, attention, and eventually the culture around him.

I kept returning to *Rally-X*.

At the time, I could not have explained why. I did not possess the language of observation functions, distributed cognition, operational images, graph topology, perceptual aliasing, or interface residuals. I knew only that I liked driving the blue car, reading the radar, collecting the flags, dropping smoke, escaping the red cars, and trying to keep two representations of the maze aligned in my head.

Decades later, the arrangement escaped the arcade.

The communicator became a phone. The phone became a camera, record collection, library, compass, map, and navigator. I began moving through the physical world with a symbolic world beside it, constantly translating one into the other.

The smartphone map is far more sophisticated than the *Rally-X* radar. It shows roads. It calculates routes. It speaks. It knows about traffic. It can change its plan before I understand why the old one failed.

But *Rally-X* still contains the clearer lesson.

Imagine the blue car moving toward a flag. The flag appears nearby on the radar. An enemy dot is approaching. The radar is accurate. The player chooses a direction and turns.

The broad symbolic view has done its job. It has identified the objective and the pursuer. But the turn carries the car into a local field that the radar does not represent. A rock enters the viewport. Perhaps it appears with enough time to avoid. Perhaps the player's attention returns a fraction too late. Perhaps the road, enemy, fuel, and rock have created a situation in which no clean escape remains.

The car strikes the rock.

Nothing necessarily malfunctioned. The flag's position was correct. The enemy's position was correct. The player's position was correct. The rock was represented by the game and may even have appeared in the local view. But it was not persistent at the same scale as the strategic decision. The information required for action was divided across representations, and the work of reuniting it had a deadline.

The player still died. A system can be accurate, useful, and insufficient at the same time.

Rally-X did not predict Google Maps by shrinking a world into a box. It revealed something more important: an interface creates an operational view by deciding what will be visible, at what scale, for how long, and to whom. Whatever the view leaves unresolved does not vanish. It becomes the residual labor of the operator and the residual uncertainty of the system.

The lesson of *Rally-X* is not that the map became the territory. It is that the rock omitted from the map can still kill you.

13 / ESSAY

Sources and Further Reading

Atari, Inc. *Battlezone: Operation, Maintenance and Service Manual*. 1980. https://www.arcade-museum.com/manuals-videogames/B/Battlezone.pdf.

Atari, Inc. *Star Raiders: An Atari Computer Adventure*. Program Instructions, 1980. https://archive.org/details/agm_star_raiders.

Bainbridge, Lisanne. "Ironies of Automation." *Automatica* 19, no. 6 (1983): 775-779. https://doi.org/10.1016/0005-1098(83)90046-8.

Chalmers, Matthew. "Seamful Design and Ubicomp Infrastructure." 2003. https://www.dcs.gla.ac.uk/~matthew/papers/ubicomp2003HCISystems.pdf.

Cheng, Bingjie, Enru Lin, Anna Wunderlich, Klaus Gramann, and Sara I. Fabrikant. "Using Spontaneous Eye Blink-Related Brain Activity to Investigate Cognitive Load During Mobile Map-Assisted Navigation." *Frontiers in Neuroscience* 17 (2023): 1024583. https://doi.org/10.3389/fnins.2023.1024583.

Dahmani, Louisa, and Véronique D. Bohbot. "Habitual Use of GPS Negatively Impacts Spatial Memory During Self-Guided Navigation." *Scientific Reports* 10 (2020): 6310. https://doi.org/10.1038/s41598-020-62877-0.

Hollan, James, Edwin Hutchins, and David Kirsh. "Distributed Cognition: Toward a New Foundation for Human-Computer Interaction Research." *ACM Transactions on Computer-Human Interaction* 7, no. 2 (2000): 174-196. https://doi.org/10.1145/353485.353487.

International Arcade Museum. "Rally-X." https://www.arcade-museum.com/Videogame/rally-x.

Kaelbling, Leslie Pack, Michael L. Littman, and Anthony R. Cassandra. "Planning and Acting in Partially Observable Stochastic Domains." *Artificial Intelligence* 101, nos. 1-2 (1998): 99-134. https://doi.org/10.1016/S0004-3702(98)00023-X.

MAME Developers. "Rally-X Hardware Implementation (rallyx.cpp)." MAME source code. https://github.com/mamedev/mame/blob/93c5d177da355468c32399eaba54b833b165ef03/src/mame/namco/rallyx.cpp.

Midway Manufacturing Co. *Midway's Rally-X: Parts and Operating Manual*. January 1981. https://www.arcade-museum.com/manuals-videogames/R/RallyX.pdf.

Namco Ltd. *Namco Museum: Included Titles Overview*. Reference Sheet No. 50-065, 2005. https://www.bandainamcoent.co.jp/corporate/press/namco/50/50-065refer.pdf.

Parikka, Jussi. *Operational Images: From the Visual to the Invisual*. Minneapolis: University of Minnesota Press, 2023. https://doi.org/10.5749/9781452970929.

Rushby, John. "Using Model Checking to Help Discover Mode Confusions and Other Automation Surprises." *Reliability Engineering & System Safety* 75, no. 2 (2002): 167-177. https://doi.org/10.1016/S0951-8320(01)00092-8.

Sega/Gremlin. *Head On*. Sales flyer, 1979. https://flyers.arcade-museum.com/videogames/show/2756.

Stanton, Neville A., R. Stewart, D. Harris, R. J. Houghton, C. Baber, R. McMaster, P. Salmon, G. Hoyle, G. Walker, M. S. Young, M. Linsell, R. Dymott, and D. Green. "Distributed Situation Awareness in Dynamic Systems: Theoretical Development and Application of an Ergonomics Methodology." *Ergonomics* 49, nos. 12-13 (2006): 1288-1311. https://doi.org/10.1080/00140130600612762.

Wickens, Christopher D. "Multiple Resources and Mental Workload." *Human Factors* 50, no. 3 (2008): 449-455. https://doi.org/10.1518/001872008X288394.

APPENDIX: TRANSMISSION

(NON-ANALYTICAL LAYER)

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This work was developed with AI-assisted analysis tools. All arguments, structures, and final judgments are the author's.

Hey Josiane,

Sum Bunny Loves You!!!